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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/711,892

10/12/2004

Anja C.S. Brau

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07/06/2009

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EXAMINER

RAMIREZ, JOHN FERNANDO

ART UNIT

PAPER NUMBER

3737

NOTIFICATION DATE

DELIVERY MODE

07/06/2009

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/711,892	Applicant(s) BRAU ET AL.	
	Examiner JOHN F. RAMIREZ	Art Unit 3737	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 July 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 34-53 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 34-53 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>7/18/08</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 07/18/08 has been entered.

Response to Arguments

Applicant's arguments filed 8/16/2007 have been fully considered but they are only partially persuasive.

Applicant alleges that the Larson reference does not disclose determining motion from non-spatially encoded data as set forth in claims 34, 44 and 48. The Examiner of record respectfully disagrees with applicant's assertions.

Larson discloses synchronizing the MR imaging data with the motion using timing information (paragraph 19) that detects the presence of motion. Larson also discloses that the timing information may be extracted from non-imaging data (paragraph 20 and 25), which is equivalent to non-spatially encoded data, because spatial encoding is inherently necessary in MRI in order to form the image.

Larson only refers as prior art to a known technique called navigator gating or navigator echo that derives a timing signal from extra, non-imaging data. However, Larson uses a different technique in which the timing information may be extracted from

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MR data not used as MR imaging data as described in paragraphs 20 and 25 of the specifications, this timing information extracted from non-imaging data, which is equivalent to non-spatially encoded data, because spatial encoding is inherently necessary in MRI in order to form the image. Therefore, Larson discloses sampling the MR signal to determine motion in the ROI based on motion data that comprises non-spatially encoded MR data free of spatially-encoded MR data (imaging data).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 34-53 are rejected under 35 U.S.C. 102(e) as being anticipated by Larson et al. (US 2004/0155653).

As per claims 34-35, 44 and 48, Larson discloses an MRI apparatus as claimed, comprising determining motion in the region of interest (Synchronizing MR images to the motion of a patient, see abstract), using any k-space trajectory (for example radial, spiral, or Cartesian, paragraph 37) that pass through the origin of k-space (This is preferably done by acquiring data along k-space trajectories that frequently pass through the center (or origin) of k-space, paragraph 36), and using non-imaging, non-spatially- encoded data (The timing information does not need to be extracted exclusively from imaging data, Paragraphs 20, 25 and 60). Further, Larson implies the possibility of acquiring data at least once every repetition interval of a pulse sequence if necessary (It is not necessary that every data acquisition trajectory pass through the k-space origin, but it is preferred that this happen relatively frequently..., so that extracted timing information provides temporal resolution that is high enough to represent the body motion of interest, paragraph 38). Further, Larson implies a plurality of gradient coils, an RF transceiver system, an RF switch, and an RF coil assembly, and a computer to process the data (processed timing data, paragraph 18), because these components are all necessary to generate an MR image. Larson further discloses using a plurality of k-space points (k-space points at or near the origin, paragraph 17).

As per claims 36-41, 45, 49 and 50, Larson further discloses using magnitude or phase information to determine motion (e.g. magnitude, phase, rate of change - may be useful for synchronizing the associated imaging data, paragraph 45). Larson discloses

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sampling MR data over a plurality of repetition time intervals for a central region of k-space prior to application of spatially encoding gradients in each repetition time interval, the k-space filled using a given k-space filling trajectory with MR data acquired (It is not necessary that every data acquisition trajectory pass through the k-space origin, but it is preferred that this happen relatively frequently ... so that extracted timing information provides temporal resolution that is high enough to represent the body motion of interest, paragraph 38). Larson discloses that the timing information may be extracted from non-imaging data (paragraph 20 and 25), which is equivalent to non-spatially encoded data; because spatial encoding is inherently necessary in MRI in order to form the image. Therefore, Larson discloses sampling the MR signal to determine motion at any time after application of a rewinder pulse (True FISP rewinds all gradients pulses each TR period to refocus transverse magnetization, paragraph 45). Larson further discloses using the motion information for retrospective or prospective gating (synchronize, paragraph 18), and respiratory- gated acquisition (Respiratory motion information can be extracted directly from the MR data and used to synchronize the image data with the quiescent period of the respiratory cycle, avoiding motion artifacts, paragraph 14).

As per claim 42, Larson further discloses an assembly with a plurality of RF coils (a surface array, paragraph 53), and combination of the information from the multiple coils (combination of the information, paragraph 54).

As per claim 43; Larson discloses acquiring MR data during non-breathhold intervals (free breathing, paragraph 14).

As per claim 46, Larson further discloses retrospective correction of phase errors (synchronization of the data can be done retrospectively, paragraph 50).

As per claim 47, Larson discloses determining fluctuations (various characteristics of the signal - e.g. rate of change, paragraph 45). The signal is inherently dependent on transverse magnetization, as all MR signals are determined by the transverse component of the spin magnetization and further discloses using the motion information to adjust scan timing, e.g. slice timing, (provide temporal correspondence with the motion, paragraph 18).

As per claims 50 and 51, Larson discloses sampling the central region of k-space associated with the ROI during the second repetition interval using the any given k-space trajectory to obtain a second non-spatially encoded data set (It is not necessary that every data acquisition trajectory pass through the k-space origin, but it is preferred that this happen relatively frequently ... so that extracted timing information provides temporal resolution that is high enough to represent the body motion of interest, paragraph 38); and wherein determining the motion in the ROI comprises assessing at least one of magnitude and phase fluctuations among the first non-spatially encoded data set and the second non-spatially encoded data set (e.g. magnitude, phase, rate of change - may be useful for synchronizing the associated imaging data, paragraph 45), wherein the MR motion data further comprises the second non- spatially-encoded data set (using non-imaging, non-spatially- encoded data. The timing information does not need to be extracted exclusively from imaging data, Paragraphs 20, 25 and 60).

As per claim 52, Larson further comprising realigning the spatially- encoded MR data prior to reconstructing the MR image (see fig. 6).

As per claim 53, Larson further comprising gating additional samplings of spatially-encoded MR data based on magnitude fluctuations (paragraph 45), wherein gating additional samplings comprises at least one of cardiac gating and respiratory gating (Respiratory motion information can be extracted directly from the MR data and used to synchronize the image data with the quiescent period of the respiratory cycle, avoiding motion artifacts, paragraph 14).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN F. RAMIREZ whose telephone number is (571)272-8685. The examiner can normally be reached on (Mon-Fri) 7:00 - 3:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian L. Casler can be reached on (571) 272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/BRIAN CASLER/
Supervisory Patent Examiner, Art
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/J. F. R./
Examiner, Art Unit 3737